

BWFS/Cons. Strategy Technical Workshop

Floodplain Restoration Opportunity Analysis (FROA) Phase 1 and 2

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PUBLIC SAFETY

ENVIRONMENTAL STEWARDSHIP

ECONOMIC STABILITY

Agenda

- FROA Phase 1 and 2
- Goal and Objectives
- Assumptions and Limitations
- Approach
- Tools and Data
- Results/Metrics
- Regional Applications

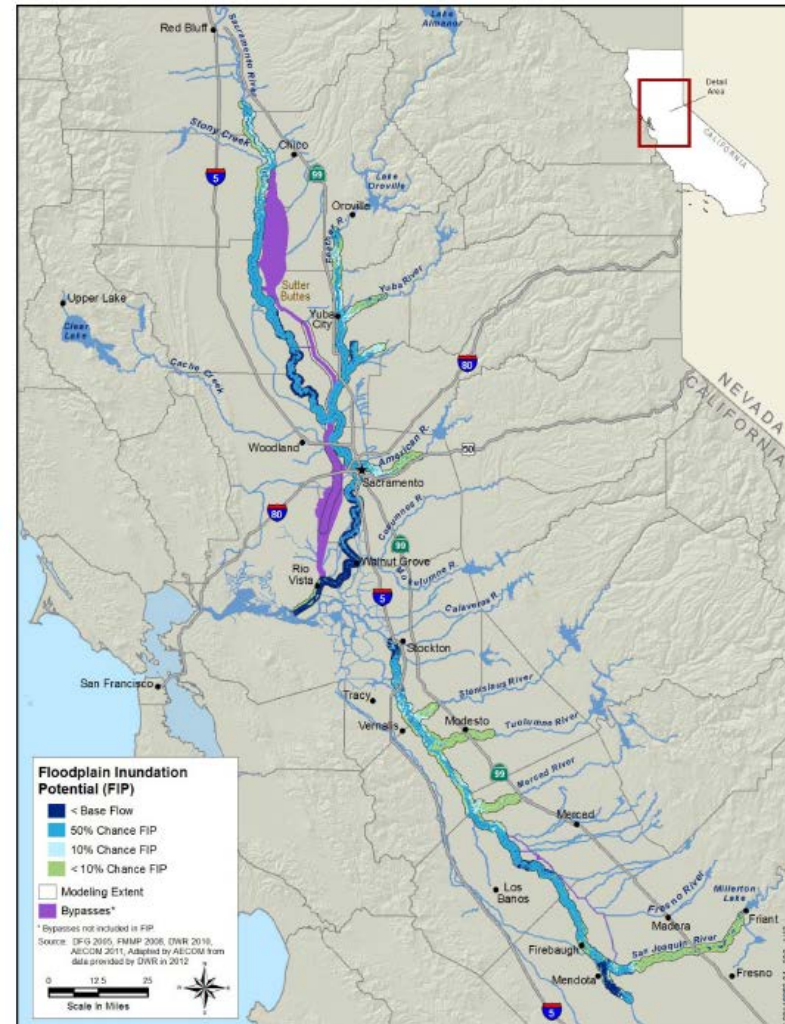


Figure 2-1. Floodplain Inundation Potential

FROA Phase 1- Goal and Objectives

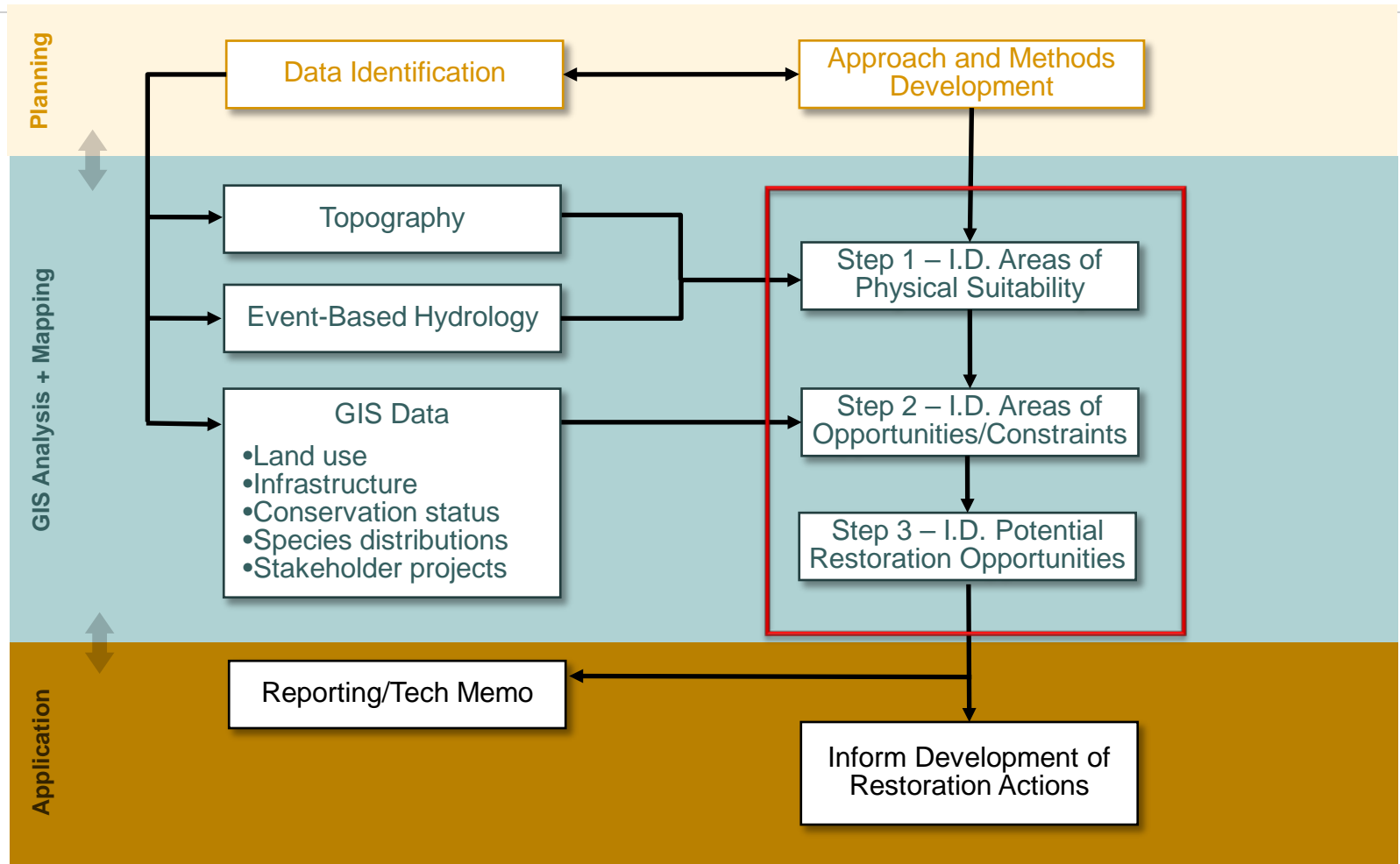
■ Goal

- Identify areas with greater and/or more extensive potential opportunities for ecological restoration of floodplains.

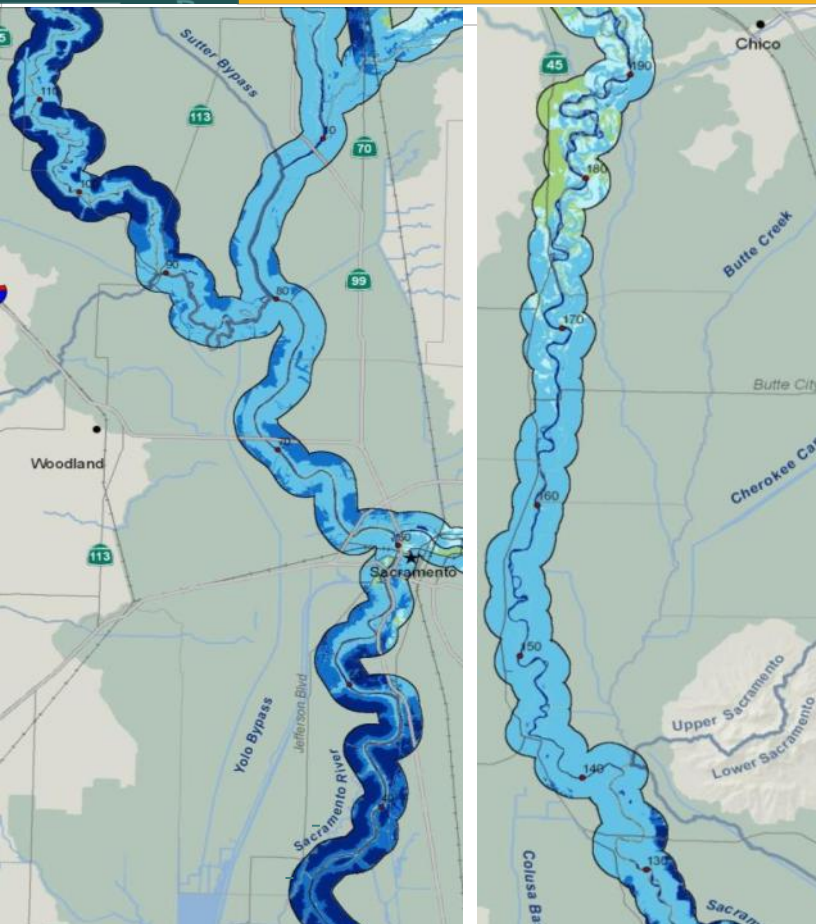
■ Objectives

- Consider physical suitability, opportunities and constraints, and, locations that stakeholders are interested in restoring.
- Adapt existing models and hydrologic data.
- Provide results to support the further development of restoration opportunities.

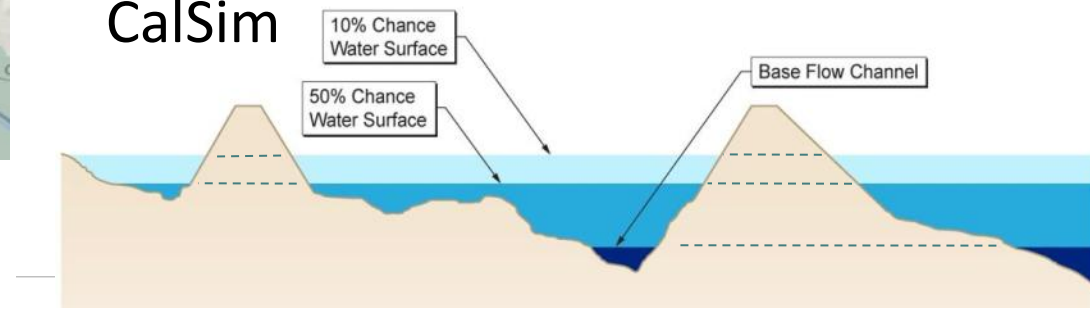
FROA Phase 1 - Approach



FROA Phase 1 - Physical Suitability

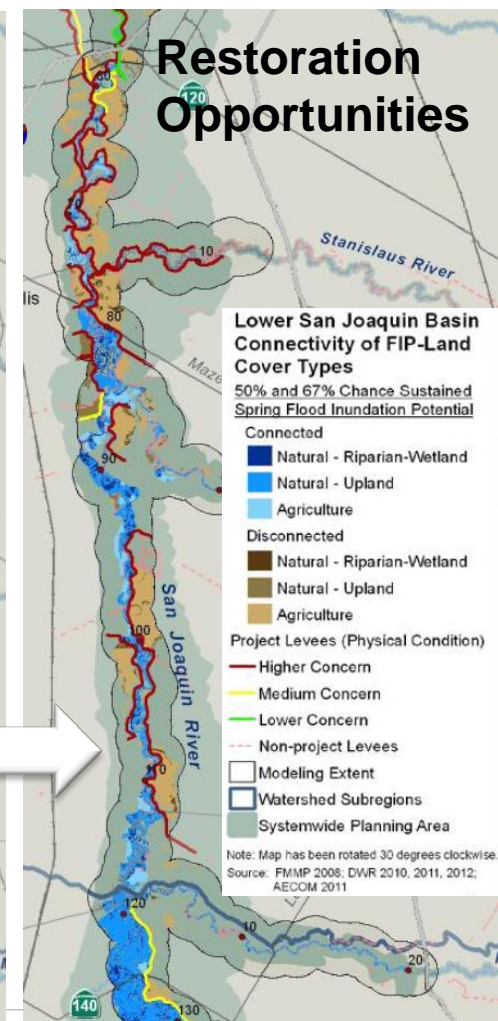
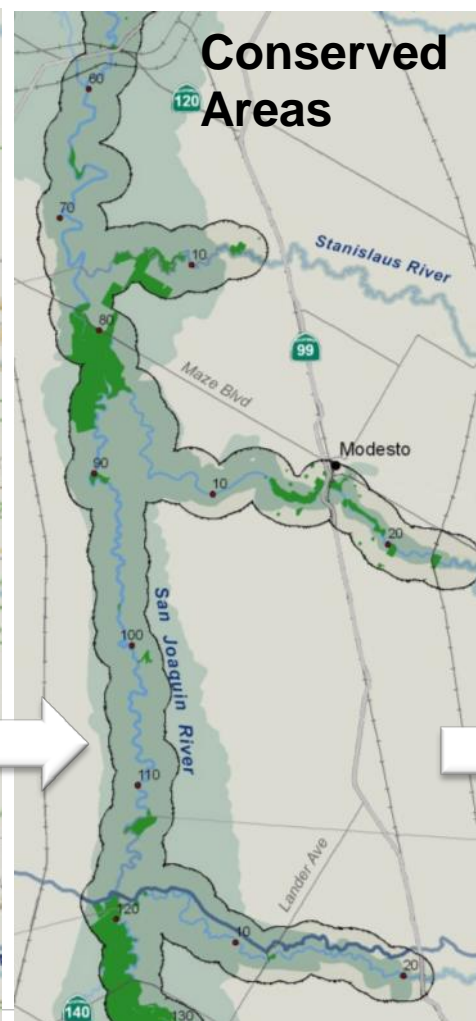
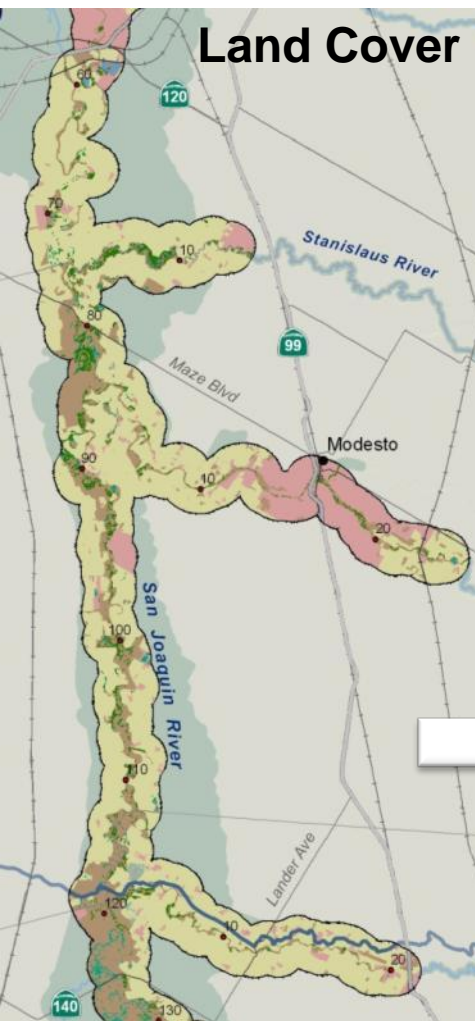


- Assessed using GIS tool: Flood Inundation Potential (FIP)
- Adapts concepts of EFM (USACE 2009), Frequently Activated Floodplain (FAF) (Williams et al. 2009)
- Tools/data sources: HAR ArcGIS tool (Dilts et al. 2010), CVFED LiDAR, Comp Study and Common Features HEC-RAS and UNET models, and CalSim



- Dark blue to light blue is Base Flow depth up to 10% Chance FIP
- Green is ground above 10% Chance FIP

FROA Ph. 1 - Constraints / Opportunities



FROA Phase 1 – Tools and Data

- River corridor maps:
 - Floodplain Inundation Potential (FIP)
 - Land use/land cover
 - Conserved areas
 - Major infrastructure
 - Connectivity of FIP-Land Cover Types
- Tabular data:
 - Floodplain Inundation Potential acreage
 - Nonurban Floodplain Connectivity Percentages
 - Distribution of Nonurban 67 Percent Chance Sustained Spring and 50 Percent Chance FIP

FROA Ph. 1 Metrics - Opportunity Areas

Table 4-1. Restoration Opportunities Along Sacramento River System

Reach	Modeled Area ¹ (Acres)	Restoration Opportunity ² (Percent of Modeled Area)					Notes
		Connected ³		Disconnected ³		Total	
		Riparian/ Wetland	Other Land Use/ Land Cover	67% Chance SS FIP ²	50% Chance FIP ²		
Sacramento River							
Woodson Bridge–Chico Landing	26,792	11	14	0	4	28	Extensive conserved land, bank swallow, yellow-billed cuckoo
Chico Landing–Colusa	56,442	14	14	<1	39	68	Bank swallow, yellow-billed cuckoo
Colusa–Verona	71,376	3	5	9	52	69	Bank swallow, yellow-billed cuckoo
Verona–American River	24,732	2	1	22	51	77	Extensive infrastructure constraints
American River–Freeport	16,969	1	1	12	8	22	Extensive development and infrastructure
Freeport–Delta Cross Channel	24,784	<1	1	28	4	33	Tidally influenced, in legal Delta
Delta Cross Channel–Deep Water Ship Channel	16,192	<1	1	2	1	3	Tidally influenced, in legal Delta
Deep Water Ship Channel–Collinsville	14,641	1	2	<1	1	3	Tidally influenced, in legal Delta
Feather River							
Thermalito Afterbay to Yuba River	35,830	6	18	<1	10	33	Historical and active gravel pits, fall-run Chinook spawning and rearing, bank swallow, yellow-billed cuckoo
Yuba River to Bear River	18,646	15	9	<1	53	78	Bank swallow
Bear River to Sutter Bypass	5,828	13	19	<1	57	89	Bank swallow, yellow-billed cuckoo
Sutter Bypass to Sacramento River	8,643	6	47	5	35	93	Bank swallow

FROA Phase 2 - Goal and Objectives

■ Goal

- Identify potential areas for floodplain-lowering and setback levees and provide input to the Basin-Wide Feasibility Studies (BWFS)

■ Objectives

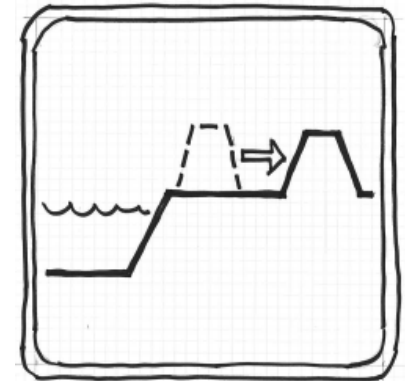
- Build on the 2012 CVFPP Floodplain Restoration Opportunity Analysis (FROA Phase 1)
- Develop a methodology
- Produce simple products; e.g., planning-level “blobs” on a map

FROA Ph. 2 - Assumptions and Limitations

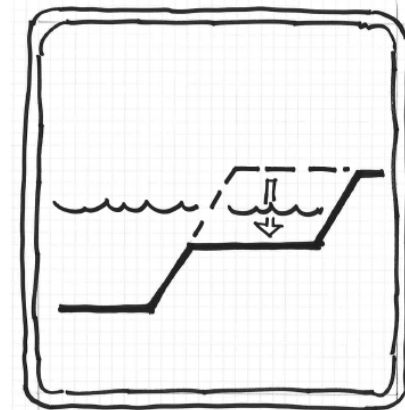
- System-wide, planning-level analyses
- Subsequent H&H, soil/geological, and other assessments required
- Potential inaccuracies in some input layers
- Some opportunities and constraints not considered
- Specific locations of actions not considered
- Not tailored to individual species

FROA Phase 2 – Limitations on Actions

- Setback levees not applicable in many areas:
 - levee condition (from ULE/NULE) of low or moderate concern
 - already in a floodway/along a bypass
 - FIP less than a 10% chance
- Lowering/modifying floodplain not applicable in many areas:
 - outside of floodway
 - with existing riparian or wetland vegetation



LEVEE SETBACK

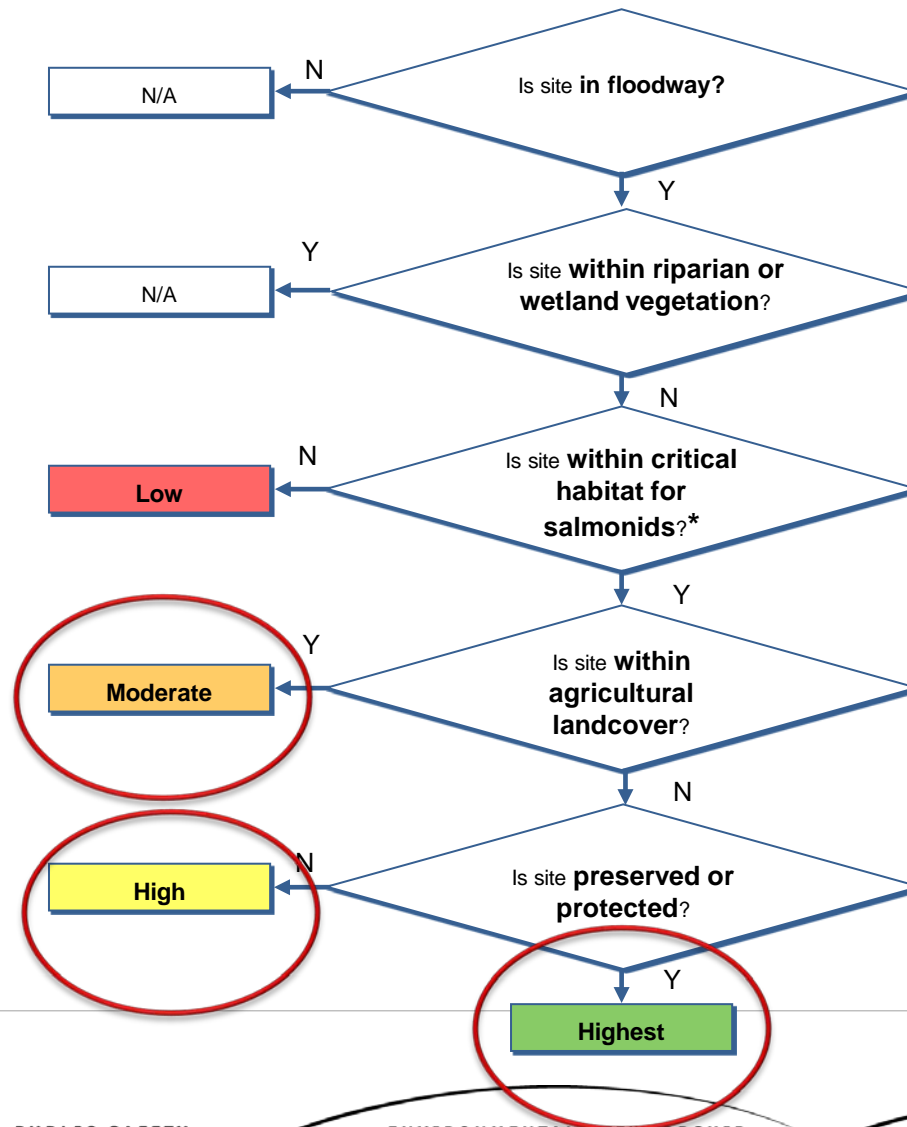


FLOODPLAIN TERRACING

FROA Phase 2 - Approach

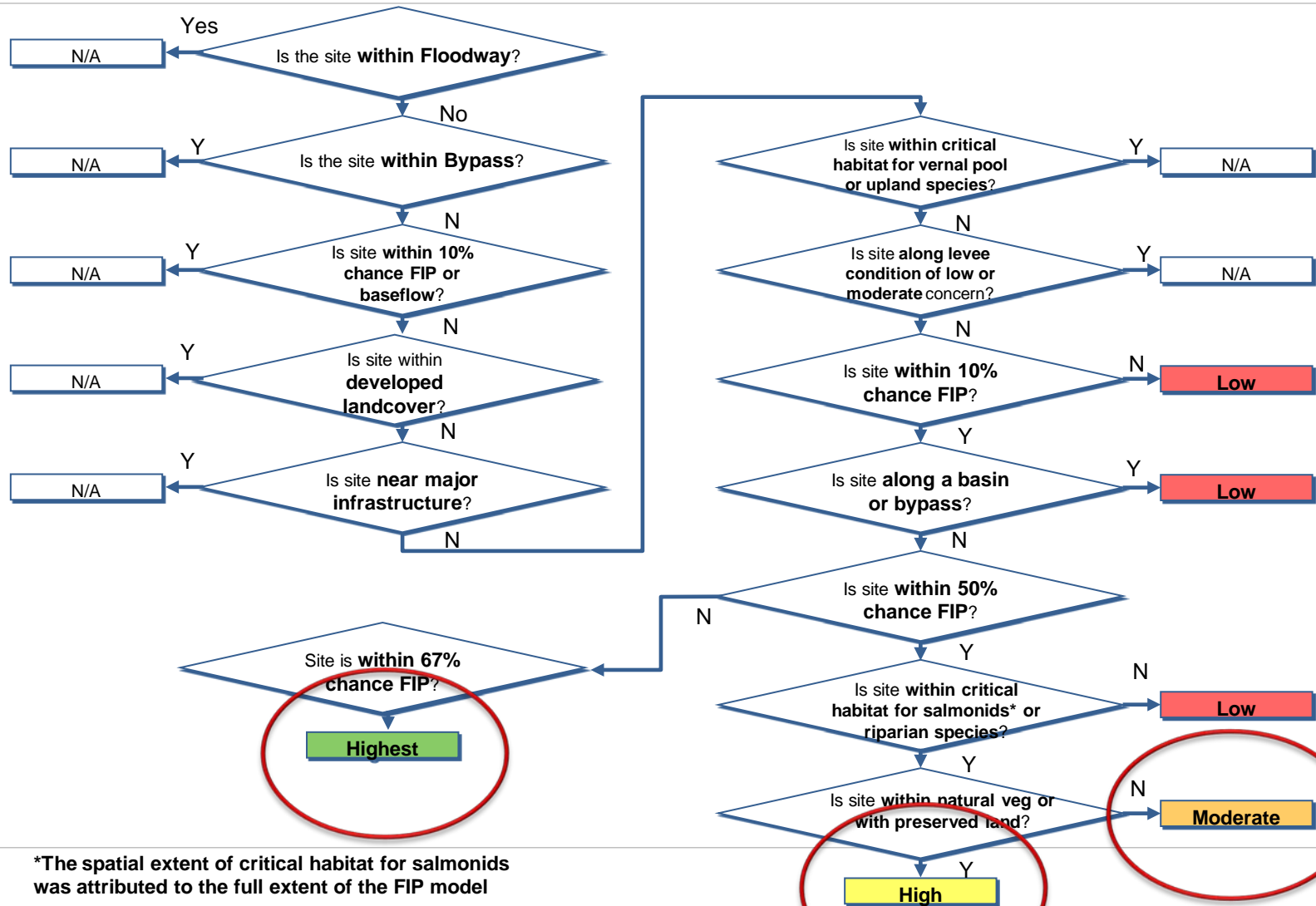
1. Prioritize action areas based on key spatial attributes into low, moderate, high, highest rankings using a GIS.
2. Review levee condition, Height Above River (HAR), and Natural Meander Zone (NMZ) map data within moderate–highest priority areas.
3. Delineate floodplain lowering and setback levee action areas using a GIS.
4. Finalize action areas as general shapes

Floodplain Lowering Spatial Prioritization



*The spatial extent of critical habitat for salmonids was attributed to the full extent of the FIP model

Levee Setback Spatial Prioritization



*The spatial extent of critical habitat for salmonids was attributed to the full extent of the FIP model

Delineate Action Areas

- Compare prioritized areas to HAR (height above river) and NMZ (natural meander zone - area of meander potential lost due to constraints).
- Floodplain lowering actions occur within existing levees.
- Levee setback actions occur outside of existing levees having high concern.
- Delineate action areas in “moderate”, “high”, or “highest” priority areas.

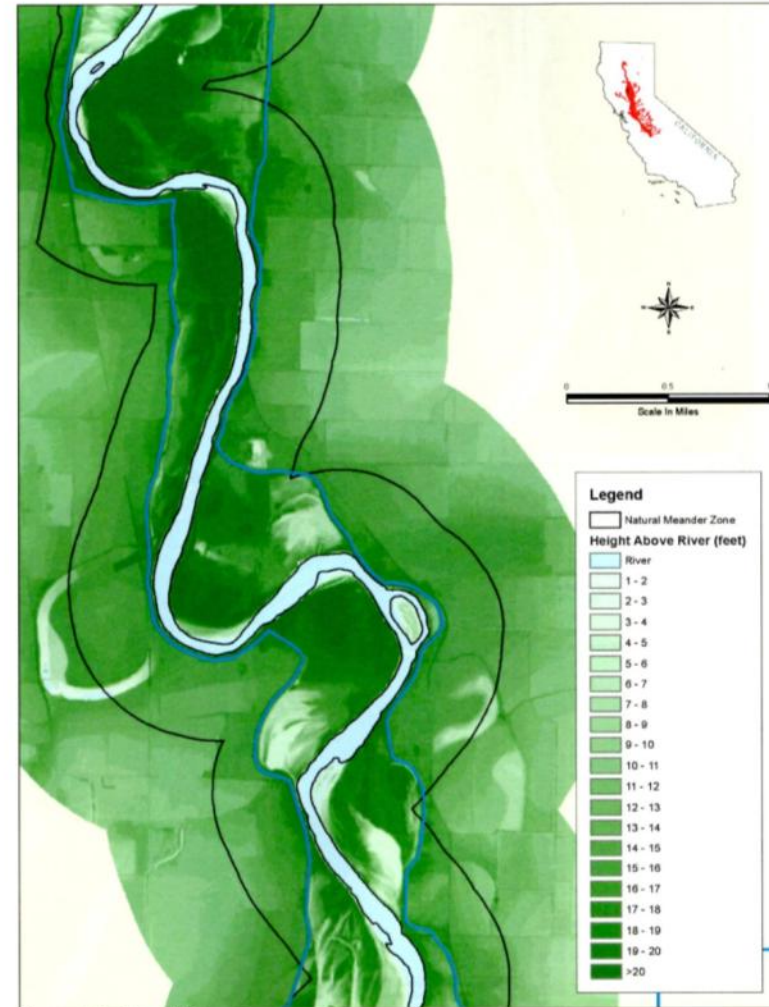


Figure 5-7. Natural Meander Zone

FROA Phase 2 – Tools and Data

- GIS Prioritization process and shapefiles for restoration actions
- River corridor maps:
 - Height Above River (HAR)
 - Floodplain Inundation Potential (FIP)
- Tabular data:
 - Acreages of Potential Floodplain-Lowering and Setback Levee Action Areas:
 - Initial areas based only on GIS Prioritization
 - Final areas refined by action area delineations

FROA Ph. 2 Metrics – Acreage of Actions

Table 6-3. Acreages of Potential Floodplain-Lowering Action Areas – Final Areas¹

	N/A	Low	Moderate	High	Highest	Total
Upper Sacramento River	297	0	1,612	191	26	2,127
Lower Sacramento River	1	0	0	15	0	16
Feather River	586	0	2,234	528	821	4,168
Upper San Joaquin River	250	0	644	468	412	1,774
Lower San Joaquin River	282	0	466	348	184	1,280
Systemwide Planning Area Total	1,416	0	4,956	1,550	1,443	9,364

Source: AECOM 2013

¹Note: These acreages represent the final results of this preliminary analysis to identify potential Floodplain-Lowering Areas.

Table 6-4. Acreages of Potential Setback Levee Action Areas – Final Areas¹

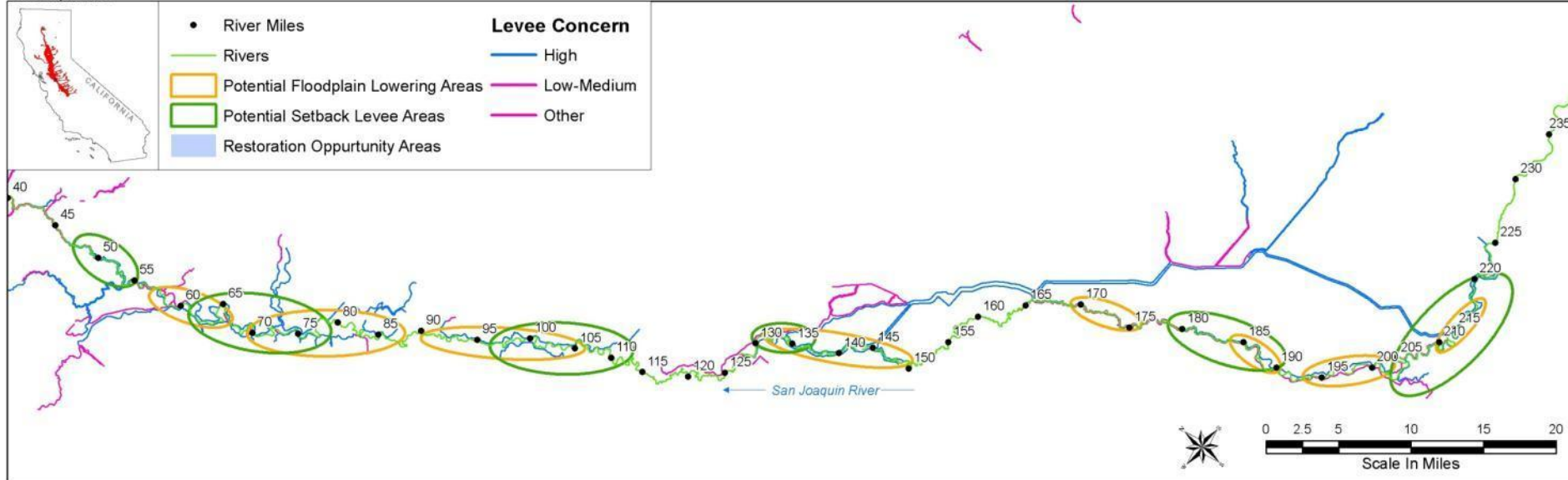
	N/A	Low	Moderate	High	Highest	Prioritization Not Applied	Total
Upper Sacramento River	1,614	25	6,993	1	810	668	10,111
Lower Sacramento River	969	25	2,241	2	909	23	4,170
Feather River	666	485	2,437			111	3,698
Upper San Joaquin River	531	692	1,959	139	379	250	3,950
Lower San Joaquin River	568	1,236	5,680	103	432	106	8,126
Systemwide Planning Area Total	4,349	2,463	19,310	245	2,530	1,159	30,055

Source: AECOM 2013

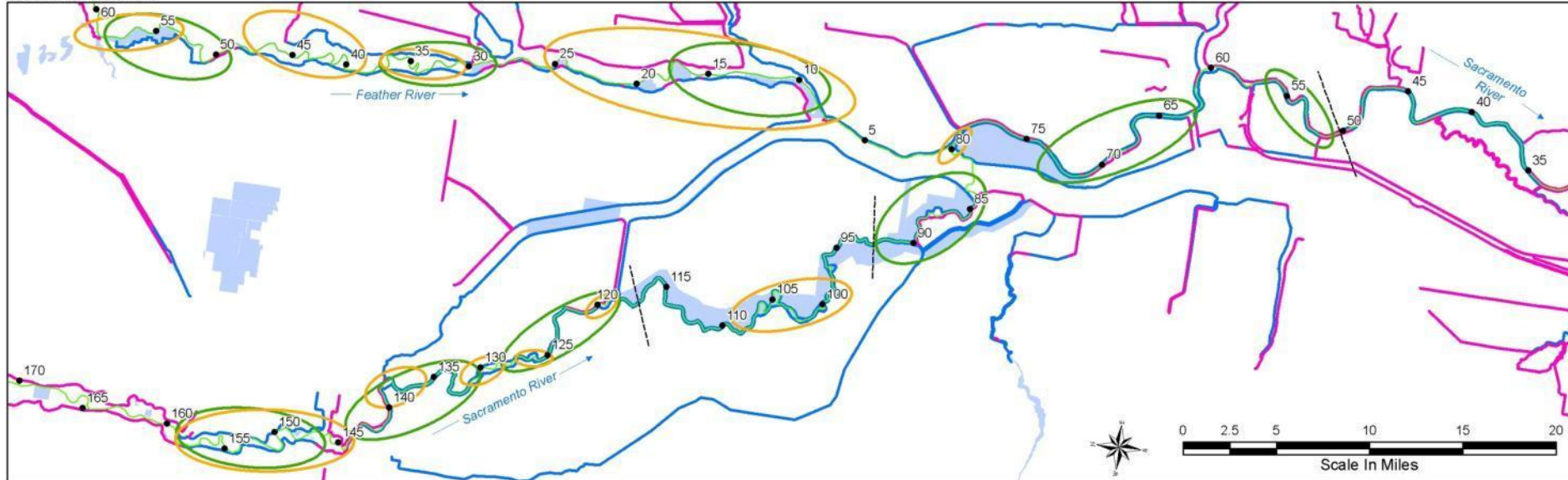
¹Note: These acreages represent the final results of this preliminary analysis to identify potential Setback Levee Action Areas.

FROA Ph. 2 Metrics – Locations of Actions

San Joaquin River



Sacramento/Feather River



FROA Ph. 2 – Regional Application Example

- *WSAFCA Southport Example: Setback Levee & (new) Floodplain Lowering Proposal*



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- Stacy Cepello/DWR FESSRO
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- Kevin Coulton/cbec
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CENTRAL VALLEY
FLOOD MANAGEMENT
PLANNING PROGRAM



2012 Central Valley Flood Protection Plan

**Attachment 9F: Floodplain
Restoration Opportunity Analysis**

June 2012

STATE OF CALIFORNIA
THE NATURAL RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES